# Ecological Survey of the Vegetation of the Sugar Pine Point Area, Tahoe National Forest, California

PSW FOREST AND RANGE EXPERIMENT STATION

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ABSTRACT

Sugar Pine Point encompasses section 20 (T16N,R13 E.) in the Tahoe National Forest. The entire section is a relatively steep, south facing slope on the north side of the canyon of the North Fork of the American River. Sugar Pine Point is under consideration for research natural area status by the U. S. Forest Service, Department of Agriculture. This report summarizes the ecological setting and characteristics of the Sugar Pine Point Area.

## INTRODUCTION

The Sugar Pine Point CRNA is located in Tahoe National Forest about four miles south of Cisco Grove. The proposed research natural area consists of section 20 on the north side of the North Fork of the American River. Road access exists through section 17 as far as the point itself (see map 1).

Physiography. Sugar Pine Point, as identified on U.S.G.S. topographic maps, is a 6325 foot knob atop the cliffs above the canyon of the North Fork of the American River. From the point itself at 6325 feet elevation the terrain slopes steeply southward toward the North Fork below, with the lower boundary of section 20 at approximately 4500 feet elevation. In one mile the elevation drops nearly 2000 feet. The entire section consists of a bowl or cirque-like slope with points or promontories extending southerly on the east and west edges of the section. As can be seen on the topographic map (map 2), additional relief is present in the middle of the bowl in the form of small drainages and rolling topography. These different topographic features support different types of vegetation, as discussed further below.

Regional Climate. There is no weather station in the Sugar Pine Point CRNA. The nearest comparable U. S. Weather Bureau station is located at Lake Spaulding, 7.5 miles northwest of section 20. Table 1 gives a summary of the climate at this station. Using the Thornthwaite model for evapotranspiration, a seasonal water balance is calculated for Lake Spaulding. Figure 1 is a diagram showing this water balance. It shows the typical Mediterranean climate characteristic of interior California stations. On the west slope of the Sierra Nevada, precipitation increases with elevation. Conifer forests follow a general distribution pattern that is directly related to moisture and elevation (Vankat, 1977).

According to Rundel, et al. (1977), the characteristic structure and composition of sierran forests are controlled by two factors, soil moisture availability during the summer and fire history. On xeric sites, ponderosa pine and black oak occur, while on more mesic sites mixed conifer forest, dominated by white fir, sugar pine, and Douglas-fir predominates (Rundel, et al. 1977).

At Lake Spaulding, the magnitude of summer water deficit (defined as Precipitation minus Potential Evapotranspiration) is about -106 mm (Table 1). At Sugar Pine Point, summer-water deficit is probably greatest on steep, south facing slopes with thin rocky soils. On more level sites, with deeper soil, more mesic conditions occur and it is these sites that support the largest trees at Sugar Pine Point.

TABLE 1

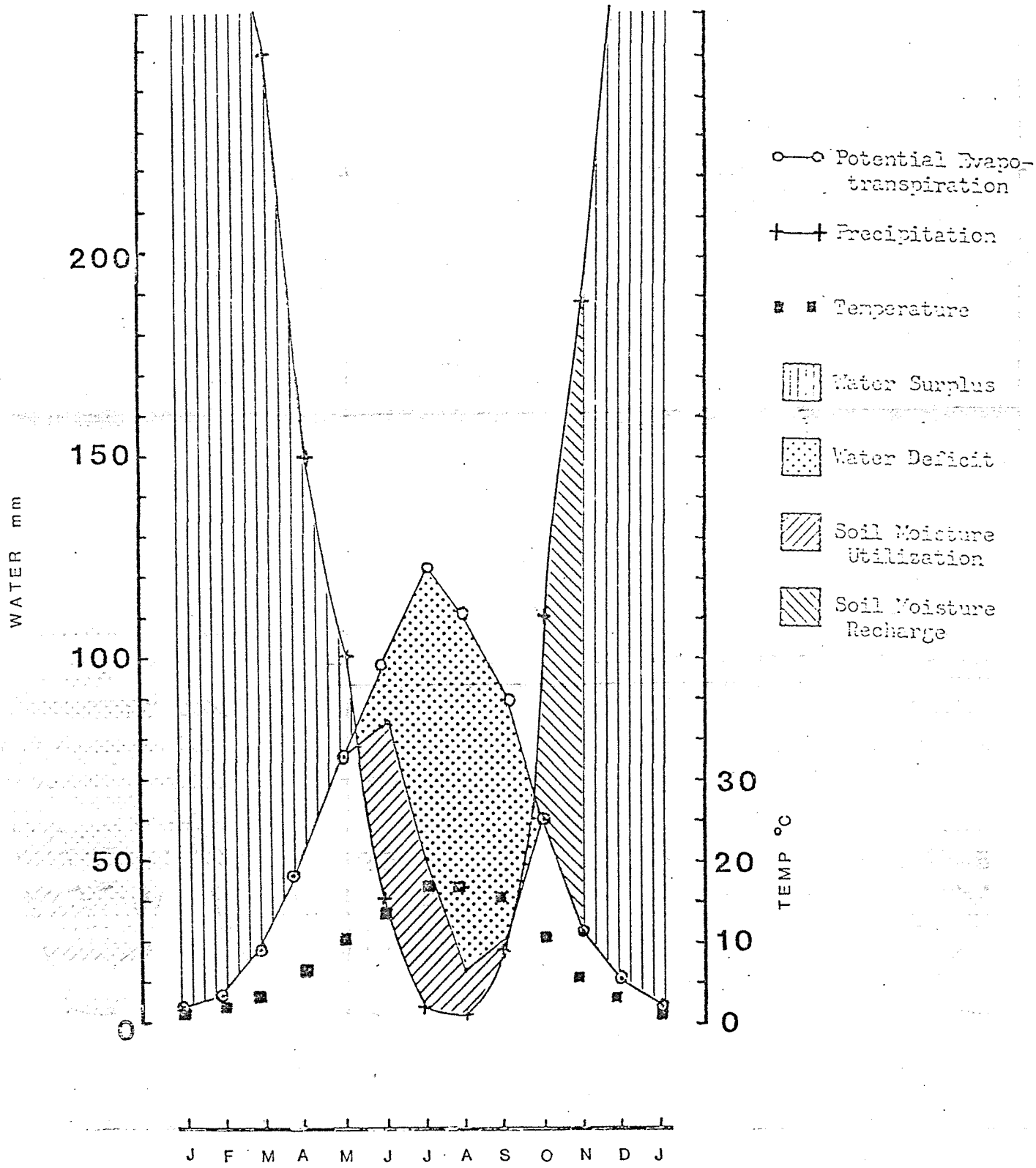
Lake Spaulding, California: Mean Monthly Water Balance

| | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Temp | 1.1 | 1.9 | 3.6 | 6.5 | 10.1 | 13.8 | 17.3 | 16.6 | 14.9 | 10.4 | 5.6 | 2.8 | 8.7°C. |
| PET | 5 | 8 | 18 | 36 | 62 | 85 | 110 | 99 | 80 | 52 | 25 | 12 | 593 |
| Ppt | 310 | 275 | 240 | 140 | 91 | 30 | 4 | 2 | 18 | 100 | 179 | 282 | 1673 |
| SStg | 300 | 300 | 300 | 300 | 300 | 250 | 177 | 129 | 106 | 154 | 300 | 300 | |
| AET | 5 | 8 | 18 | 36 | 62 | 80 | 77 | 50 | 42 | 52 | 25 | 12 | 467 |
| Def. | 0 | 0 | 0 | 0 | 0 | 6 | 33 | 49 | 38 | 0 | 0 | 0 | 126 |
| Surp. | 305 | 267 | 221 | 105 | 29 | 0 | 0 | 0 | 0 | 0 | 8 | 270 | 1206 |

Temp= Temperature °C., PET= Potential Evapotranspiration mm., Ppt = Precipitation mm., SStg = Soil Water Storage in mm., AET = Actual Evapotranspiration mm., Def. = Water Deficit mm., Surp. = Water Surplus mm.

FIGURE 1

WATER BALANCE LAKE SPAULDING, CALIFORNIA



## Soils and Geology

The Sugar Pine Point area is underlain by Paleozoic and Jurassic marine sedimentary and metasedimentary rocks. The 6325 foot elevation knob identified as the actual Sugar Pine Point on the topographic maps is a remnant of a Miocene volcanic plug capped by Pleistocene glacial deposite (Burnett and Jennings, 1962). Extensive exposures of granite occur to the north and east, but are only a minor component at section 20. Soil development is, for the most part, poor, the steepness of the topography resulting in rapid erosion of finer soil particles. Consequently, there are well-developed soils only in a few of the more level portions of the section, and it is these sites that support mature trees. Non-forested steep, rocky slopes and cliffs account for most of the area.

## Vegetation

Vegetation of the Sugar Pine Point CRNA consists of a mosaic of mixed conifer or "Ponderosa Pine-Sugar Pine-Fir" (SAF 243) forest, stands of black oak (Q. kelloggii), and, on steep slopes, montane chaparral dominated by Arctostaphylos patula, Ceanothus integerrimus, Quercus vaccinioides, and Castanopsis chrysophylla. The vegetation reflects a complex topography and fire history. Small stands of large diameter mature conifers occur on relatively gentle slopes on both the west and east sides of section 20. The central portion of section 20 is occupied by brush and stands of black oak. Meadow vegetation of grasses and sedges does not occur to any significant extent anywhere in the section, but a wide variety of herbaceous species,

including annuals in the genera Collinsia, Madia, Cryptantha, Polygonum, Gilia, and Navarretia, and herbaceous perennials such as Helianthella californica, Brodiaea spp, Senecio canus, Arabis holboelii, Lupinus spp., Sidalcea malvaeflora, and Mimulus spp. are widespread over the area. Perennials including Apocynum androsaemifolium, Monardella odoratissima, Eriogonum spp., Penstemon deustus, Penstemon laetus, Zauschneria californica, Solidage elongata, and Amelanchier pallida are also widespread. Table 2 summarizes the extent of the various plant communities at Sugar Pine Point.

TABLE 2. Importance of generalized vegetation types in the Sugar Pine Point CRNA. Percent of types estimated in the field.

| Vegetation | % of area |
|---|---|
| Ponderosa Pine-Sugar Pine-Fir (SAF 243) (mixed conifer) | 40% |
| California Black Oak (SAF 246) | 15 |
| Montane Chaparral | 35 |
| Rocky Herbaceous Communities | 10 |

## SURVEY METHODS

We surveyed Sugar Pine Point CRNA in late summer 1980. After an initial reconnaissance, we were able to locate all the major habitat types in the area. A plant species list was compiled consisting of about 109 species, which are listed in table 3. For characterization of the vegetation, we sampled fourteen plots which were located to cover the range of habitat types in the section. Each sample plot was located, as far as was practical, in a homogeneous patch of vegetation. A list of species in each plot was made, and their cover estimated. A tape was used to delimit a circular plot at sample locations where tree data were collected. The size of the plot varied from site to site. Plot size was chosen to include only a single vegetation type. Minimum plot size was of radius = 10 meters. Maximum plot size was of 30-meter radius. In plots where tree data were collected, we measured DBH for all living stems one centimeter or greater in diameter. For stems below breast height, basal diameter was measured. The locations of five tree plots is shown on map 2.

## VEGETATION TYPES

Table 3 is an association table based on our plot data. Groups of associated species are listed on the left side of the table. The fourteen sample stands are given across the top of the table. Cover is indicated by the Braun-Blanquet scale as follows:

R = rare in plot

\+ = less than 1% cover

1 = 5% cover

1 = 5-25% cover

3 = 25-30% cover

4 = 50-75% cover

5 = greater than 75% cover

| | TABLE 3 | 1 | 3 | 4 | 7 | 11 | 12 | 14 | 15 | 2 | 6 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1600 | ABIES CONCOLOR | 1 | 2 | | + | + | + | + | 1 | | + | + | | 1 |
| 1605 | ABIES MAGNIFICA | + | + | | + | + | + | + | | | + | + | | |
| 1610 | PINUS JEFFREYI | 1 | 2 | 1 | + | + | + | | | | + | | | + |
| 1615 | PINUS LAMBERTIANA | + | 2 | 1 | + | + | + | + | + | + | + | + | | 1 |
| 1625 | PSEUDOTSUGA MENZIESII | | | 1 | | | + | | | | | | | + |
| 1590 | LIBOCEDRUS DECURRENS | + | 1 | 1 | | + | + | + | + | 1 | | | | + |
| 2100 | CHIMAPHILA MENZIESII | R | | | + | + | + | | | | | | | + |
| 2110 | PTEROSPORA ANDROMEDEA | R | | | | | | | | | | | | |
| 1764 | STIPA COLUMBIANA | | | | | | | | | 2 | | | | |
| 2995 | APOCYNUM ANDROSAEMIFOLIUM | + | | | + | + | | + | | | | | | |
| 520 | SYMPHORICARPOS ACUTUS | | | | | | | | | | + | + | | |
| 47 | BRODIAEA HYACINTHINA | R | | | | | | | | | + | | | |
| 2085 | PTERIDIUM AQUILINUM VAR PUB | + | | | + | + | | + | | | | | | + |
| 395 | CRYPTANTHA SPP | + | | | | | | | | | | | | |
| 35 | ALLIUM CF TRIBRACTEATUM | + | | | | | | | | | | | | |
| 1740 | POA PALUSTRIS | | | | | | | | | | | | 1 | |
| 1820 | LINANTHUS CILIATUS | | | | | | | | | | | | | |
| 345 | SENECIO CANUS | + | | + | | | | | | | | | | |
| 353 | SENECIO SP | | | | | | | | | | | | | |
| 95 | PERIDERIDIA GAERDNERI | + | | | | | | | | | | | | |
| 325 | MADIA MINIMA | + | | | | | | | | | | | | |
| 2595 | COLLINSIA PARVIFLORA | + | + | | | | | | | | | | | |
| 1300 | CALOCHORTUS LEICHTLINII | + | | | | | | | | | | | | |
| 1405 | MONARDELLA ODORATISSIMA | + | | | | | | | | | | | | |
| 1665 | BROMUS MARGINATUS | 1 | | | | | | | | | | | | |
| 424 | ARABIS HOLBOELLII | + | | | | | | | | | | | 1 | |
| 1383 | SIDALCEA MALVAFLORA | + | | | | | | | | | | | | |
| 415 | PLAGIOBOTHRYS HISPIDULUS | | | | | | | | | | | | | |
| 220 | CHRYSOPSIS BREWERI | + | | | | | | | | | | | | |
| 2610 | CORDYLANTHUS BOLANDERI | | + | | | | | | | | | | | |
| 2015 | ARCTOSTAPHYLOUS PATULA | + | 2 | 1 | | + | + | 1 | | 1 | 2 | | | |
| 2245 | CEANOTHUS INTEGERRIMUS | + | | | + | | | 1 | + | | | 1 | | |
| 2430 | SALIX LEMMONII | + | | | | | | | | | | | | |
| 2265 | AMELANCHIER PALLIDA | + | | | + | | + | | | | | | | + |
| 1055 | QUERCUS VACCINIFOLIA | + | 1 | 2 | + | + | 2 | + | | 1 | 2 | 3 | | |
| 2240 | CEANOTHUS FRESNENSIS | + | + | + | | | + | | | 5 | 1 | | | |
| 2045 | CASTANOPSIS SEMPERVIRENS | | | | | | | | | | | | | + |
| 2345 | PRUNUS EMARGINATA | | + | | | | | | | | 2 | | | |
| 1050 | QUERCUS KELLOGII | 1 | + | | + | + | | 1 | + | 3 | 1 | 2 | + | |
| 1490 | GAYOPHYTUM HUMILE | | + | | | | | | + | | | | | |
| 2710 | PENSTEMON DEUSTUS | | | + | | | | | | + | | | + | |
| 2000 | CALYPTRIDIUM UMBELLATUM | | R | | | | | | | | | | | |
| 2997 | POLYSTICHUM | + | | | | | | | | | | | | |
| 1917 | ERIOGONUM SAXATALE | | | + | | | | + | | | | | | |
| 1795 | GILIA LEPTALIA | | | | | | | | | | | | | |
| 1010 | ARCTOSTAPHYLOUS NEVADENSIS | | | + | | | | | | | | | | 1 |
| 1505 | ZAUSCHNERIA CALIFORNICA SSP | | | + | | + | | | | | | | + | |
| 1345 | SMILACINA STELLATA | | | | + | | | | | | | | | |
| 2125 | PYROLA PICTA | | | | + | | | | | | | | | |
| 2095 | ALLOTROPA VIRGATA | | | | | + | | | | | | | | |
| 1152 | JUNCUS SP | | | | | | + | | | | | | | |
| 1565 | GOODYERA OBLONGIFOLIA | | | | | + | | | | | | | | |
| 12 | ALLIUM SP | | | | | | | | | | | | | |

TABLE 3 (cont.)

| | | |

Four, and possibly five, vegetation types or plant associations can be recognized in the table. The four are listed in table 2. The fifth is only in part distinct, and represents a weakly developed riparian association along the intermittent watercourse of Little Granite Creek.

## Conifer Forest

Ponderosa Pine-Sugar Pine-Fir. Eight of our sample stands correspond to this type (SAF 243), which is defined by the dominance of ponderosa pine, sugar pine, white fir, douglas fir, and/or incense cedar. This is the so-called "mixed conifer" forest, and is the most common forest type in the Sierra Nevada between 3000 and 6000 feet elevation. Although the same species of conifers are present throughout the area, there is wide variatin in size class distribution and dominance in the sample stands (see table 4). Stand 5 represents a "dog-hair" stand of white fir, with a high density of small diameter white firs, a few older jeffrey pines, and a few scattered, large red firs. The dense growth of white fir has formed a dense canopy, and the remains of Quercus vaccinifolia and Arctostaphylos patula, now shaded out, indicate that the site was previously heavily covered with brush.

Stand 7 is a stand of mature trees on a relatively level site below Sugar Pine Point. Soil here is fairly deep and well developed, and the area is surrounded on three sides by cliffs that drop precipitously to the North Fork below. The position of this stand atop these cliffs may have prevented fires from reaching the site. Mature jeffrey pines and sugar pines dominate with numerous smaller white firs also present. Incense cedar is only a minor component.

Stand 11 contains mid-sized trees of red fir, sugar pine, and Douglas-fir. Some jeffrey pines and incense cedars are also present, along with the

TABLE 4

| Species | Basal Area ($m^2$/ha) | Density (#/ha) | Rel. Dom. | Rel. Dens. | Importance Value | Stem Diam. ($\bar{X}$ ±SD) |
|---|---|---|---|---|---|---|
| | | Stand No. 5 | | | | |
| Abies concolor | 5.09 | 721.65 | .74 | .96 | 2.64 | 7.72±5.8 |
| Abies magnifica | 11.32 | 14.15 | .16 | .02 | .20 | 101.0 |
| Pinus jeffreyi | 18.82 | 28.30 | .10 | .03 | .17 | 90.75 ±22.27 |
| | | Stand No. 7 | | | | |
| Abies concolor | 25.42 | 198.24 | .08 | .64 | 1.36 | 20.6 ±24.7 |
| Pinus jeffreyi | 6.04 | 7.08 | .54 | .02 | .58 | 78.50 ±96.9 |
| Pinus Lambertiana | 22.55 | 38.94 | .37 | .13 | .63 | 53.96 ±70.1 |
| Calocedrus decurrens | 0.98 | 63.72 | .01 | .21 | .43 | 10.00 ±10.9 |
| | | Stand No. II | | | | |
| Abies concolor | 3.84 | 447.92 | .21 | .67 | 1.55 | 7.46 ±7.75 |
| Abies magnifica | .94 | 10.18 | .04 | .02 | .08 | 34.00 ±5.7 |
| Pinus jeffreyi | .39 | 30.54 | .01 | .05 | .11 | 8.67 ±10.2 |
| Pinus lambertiana | 11.24 | 106.89 | .52 | .16 | .84 | 29.91 ±21.6 |
| Calocedrus decurrens | .75 | 30.54 | .03 | .05 | .13 | 14.33 ±11.4 |
| Pseudotsuga menzeisii | 4.12 | 40.72 | .19 | .06 | .31 | 29.88 ±21.2 |
| -----Totals------ | | | | | | |
| Stand 5 | 35.23 | 764.10 | | | | |
| Stand 7 | 54.99 | 307.88 | | | | |
| Stand 11 | 21.28 | 666.79 | | | | |

TABLE 4

| Species | Basal Area ($m^2$/ha) | Density (#/ha) | Rel. Dom. | Rel. Dens. | Importance Value | Stem Diam. ($\bar{X} \pm SD$) |
|---|---|---|---|---|---|---|
| | | Stand No. 12 | | | | |
| Abies concolor | 33.63 | 302.39 | .08 | .66 | 1.34 | 17.68 ±33.7 |
| Pinus ponderosa | 39.09 | 55.72 | .11 | .12 | .34 | 90.0 ±31.1 |
| Pinus lambertiana | 25.87 | 103.48 | .56 | .22 | .99 | 23.67 ±46.9 |
| Calocedrus decurrens | 11.72 | 39.80 | .25 | .09 | .42 | 44.4 ±47.2 |
| | | Stand No. 14 | | | | |
| Abies concolor | .47 | 47.76 | .06 | .11 | .28 | 8.17 ±47.2 |
| Pinus ponderosa | .07 | 15.92 | .01 | .04 | .09 | 7.50 ±2.2 |
| Pinus lambertiana | .06 | 23.88 | .01 | .05 | .11 | 4.00 ±5.2 |
| Calocedrus decurrens | 2.65 | 135.32 | .34 | .30 | .94 | 12.76 ±10.2 |
| Quercus kelloggii | 6.47 | 222.88 | .92 | .50 | 1.92 | 17.04 ±8.9 |
| | | ---------Totals--------- | | | | |
| Stand 12 | 110.31 | 501.39 | | | | |
| Stand 14 | 9.72 | 222.88 | | | | |

ubiquitous immature white firs. This stand occurs on the east side of the area above Little Granite Creek on fairly well-developed soil.

Stand 12 is also located on the east side of section 20, but further downslope than stand 11. Mature ponderosa pines and incense cedar dominate the site, with a few scattered, large individuals of sugar pine and numerous sugar pine saplings. Mature white firs are also present and white fir seedlings abound. The stand appears to be nearing maturity with good reproduction of sugar pine. White fir is also reproducing heavily and, eventually, will probably dominate the site.

Stand 14 is primarily a black oak grove, however, there is now some establishment of ponderosa pine, sugar pine, and white fir. Incense cedar is also abundant. The average stem-diameter given in table 4 may be somewhat misleading because it represents a measure of live stems and not of root crowns. Q. kelloggii root crowns in the stand ranged from one to one and one-half meters in diameter, indicating greater age for these oaks than might be expected from stem diameters alone.

## Non-Forest Vegetation

The most abundant non-forest vegetation in the Sugar Pine Point area is montane brush. As discussed above, the entire section consists of a bowl or cirque-like south-facing slope in the center of the sectin, with more gentle contours on the east and west sides. The heaviest concentration of brush is in this central bowl area on the steepest part of the slope. Fire could be carried easily on this slope, and we infer that fire is probably the factor responsible for maintaining these brush fields. In much of the brush there

are conifer saplings pushing up through the shrub cover. If fire does not occur the brush will eventually be shaded out and give way to conifer forest. This has happened in other parts of the area, as evidenced in stand five.

In open rocky sites, the brush fields give way to communities of herbs and small perennials, grasses, and perennial herbs. A typical site is stand 9. Along the stream bed of Little Granite Creek, a weakly-developed, riparian vegetation occurs with Acer glabrum, Spirea densiflora, Lonicera conjugialis, Lilium parvum, and others (stand 10).

Rare Plants. Several rare plants are mapped in the vicinity of Sugar Pine Point. Although we did not specifically search for rare plants, it is recommended that a thorough survey for the plants listed in table 5 be conducted prior to road construction, timber sale, or other high-impact uses of the area.

TABLE 5

RARE PLANTS MAPPED ON THE DUNCAN PEAK QUADRANGLE (list 2)

| Species | Status (Calif. Native Plant Society) |
|---|---|
| Cypripedium fasciculatum | 3-2-2-2 |
| Lewisia pygmaea ssp longipetala | 2-1-1-3 |
| Lewisia serrata | 2-1-1-3 |
| Phacelia stebbinsii | 2-1-1-3 |

## STATUS OF CONIFER FORESTS WITHIN THE SUGAR PINE POINT AREA

Succession of montane brush to conifer forest is occurring in much of the area, but fires on steep, brush-covered slopes may prevent the conifer saplings in these sites from ever reaching maturity. Black oak in some areas is well established and may have survived fires by sprouting from extensively-developed root crowns. Mature or nearly mature conifer forest occurs in only two areas, these are relatively level compared to areas dominated by brush and are isolated from the slopes that fall away to the canyon of the North Fork of the American River by vertical cliffs. This may have resulted in these areas being protected from past fires.

The majority of conifer forest in the Sugar Pine Point area is now undergoing succession to white fir. It is assumed by most foresters that recent decreased fire frequency in the Sierra has resulted in an increase in white fir throughout the range. In general, only white fir and incense cedar show high concentrations of individuals in the smaller size classes (fig. 2). We infer that, if present trends continue, white fir and incense cedar will come to dominate most of the conifer sites.

## SUMMARY AND RECOMMENDATIONS

The Sugar Pine Point Area has a number of features that make it an excellent candidate for a research natural area: (1) The area represents a discrete unit of watershed; (2) Good examples of various stages of succession in mixed conifer forest are present; (3) The area represents a zone of overlap of ponderosa pine and jeffrey pine; (4) The amount of mature timber is slight and access to the area is difficult because of the steep topography, so its usefulness for commercial timber production is minimal.

Studies of succession of brush to conifer forest are relatively few. The Sugar Pine Point area provides an excellent site to study the dynamics of this successional pattern and its relation to fire ecology in the mixed conifer forest. Comparative ecology of ponderosa pine and jeffrey pine, both important commercial conifers, could be studied also in this area. Both species occur, jeffrey pines in the upper portions of section 20 and ponderosa pines in the lower, with zones of overlap in between. The ecological requirements of the two species might be further clarified by careful work in areas of this type.

Other advantages of the area in terms of scientific study include access to the north edge of section 20 via road through section 17 and the mapped occurrence of several rare plants in the general area.

SPECIES LIST (Vascular plants at Sugar Pine Point, Aug. 1980)

ACERACEAE

5 ACER GLABRUM

AMARYLLIDACEAE

35 ALLIUM CF TRIBRACTEATUM
12 ALLIUM SP
47 BRODIAEA HYACINTHINA

APIACEAE

55 ANGELICA BREWERI
493 LOMATIUM DISSECTUM
84 LOMATIUM SP
95 PERIDERIDIA GAERDNERI
100 PTERYXIA SP

APOCYNACEAE

2995 APOCYNUM ANDROSAEMIFOLIUM

ASTERACEAE

215 CHAENACTIS NEVADENSIS
220 CHRYSOPSIS BREWERI
227 CHRYSOTHAMNUS SP
269 ERIGERON SP
280 GNAPHALIUM CALIFORNICUM
295 HAPLOPAPPUS BLOOMERI
300 HELIANTHELLA CALIFORNICA VAR NEVADENSIS
305 HIERACIUM ALBIFLORUM
325 MADIA MINIMA
345 SENECIO CANUS
350 SENECIO TRIANGULARIS
355 SOLIDAGO ELONGATA
375 WYETHIA MOLLIS

BORAGINACEAE

395 CRYPTANTHA SPP
410 PLAGIOBOTHRYS COGNATUS
415 PLAGIOBOTHRYS HISPIDULUS

BRASSICACEAE

424 ARABIS HOLBOELLII

CAPRIFOLIACEAE

CRASSULACEAE

590 SEDUM LANCEOLATUM

CYPERACEAE

720 CAREX EXSERTA
765 CAREX ROSSII
790 CAREX CF SUBNIGRICANS
798 CAREX SP

ERICACEAE

1010 ARCTOSTAPHYLOS NEVADENSIS
1015 ARCTOSTAPHYLOS PATULA

FABACEAE

1230 LUPINUS LYALLII
1242 LUPINUS SP

FAGACEAE

1045 CASTANOPSIS SEMPERVIRENS
1050 QUERCUS KELLOGGII
1055 QUERCUS VACCINIFOLIA

HYDROPHYLLACEAE

1125 PHACELIA SPP

JUNCACEAE

1140 JUNCUS DRUMMONDII
1152 JUNCUS SP

LILIACEAE

1300 CALOCHORTUS LEICHTLINII
1345 SMILACINA STELLATA
355 ZYGADENUS VENOSUS

LORANTHACEAE

1375 PHORADENDRON FLAVESCENS

MALVACEAE

1383 SIDALCEA MALVAEFLORA

MENTHACEAE

1405 MONARDELLA ODORATISSIMA

ONAGRACEAE

1460 CLARKIA RHOMBOIDEA
1490 GAYOPHYTUM HUMILE
1505 ZAUSCHNERIA CALIFORNICA SSP LATIFOLIA

ORCHIDACEAE

1565 GOODYERA OBLONGIFOLIA
1550 HABENARIA UNALASCENSIS

PINACEAE

1600 ABIES CONCOLOR
1605 ABIES MAGNIFICA
1590 LIBOCEDRUS DECURRENS
1610 PINUS JEFFREYI
1615 PINUS LAMBERTIANA
1624 PINUS PONDEROSA
1625 PSEUDOTSUGA MENZIESII

POACEAE

1665 BROMUS MARGINATUS
1700 ELYMUS GLAUCUS
1740 POA PALUSTRIS
1750 SITANION HYSTRIX
1764 STIPA COLUMBIANA
1764 STIPA SP

POLEMONIACEAE

1790 COLLOMIA GRANDIFLORA
1797 GILIA CAPITATA
1795 GILIA LEPTALIA
1820 LINANTHUS CILIATUS
1825 LINANTHUS SPP
1840 NAVARRETIA PROPINQUA
1850 PHLOX DIFFUSA

POLYGONACEAE

1917 ERIOGONUM SAXATILE

PORTULACACEAE

2000 CALYPTRIDIUM UMBELLATUM

PTERIDACEAE

2060 CHEILANTHES GRACILLIMA
2065 CRYPTOGRAMMA ACROSTICHOIDES
2087 ONCHIUM DENSUM
2997 POLYSTICHUM
2085 PTERIDIUM AQUILINUM VAR PUBESCENS

PYROLACEAE

2095 ALLOTROPA VIRGATA
2100 CHIMAPHILA MENZIESII
2110 PTEROSPORA ANDROMEDEA
2125 PYROLA PICTA

RHAMNACEAE

2240 CEANOTHUS FRESNENSIS
2245 CEANOTHUS INTEGERRIMUS

ROSACEAE

2265 AMELANCHIER PALLIDA
2345 PRUNUS EMARGINATA
2370 SPIRAEA DENSIFLORA
520 SYMPHORICARPOS ACUTUS
525 SYMPHORICARPOS PARISHII

RUBIACEAE

2380 GALIUM BIFOLIUM
2387 GALIUM MULTIFLORUM
2395 GALIUM SPP
2400 KELLOGGIA GALIOIDES

SALICACEAE

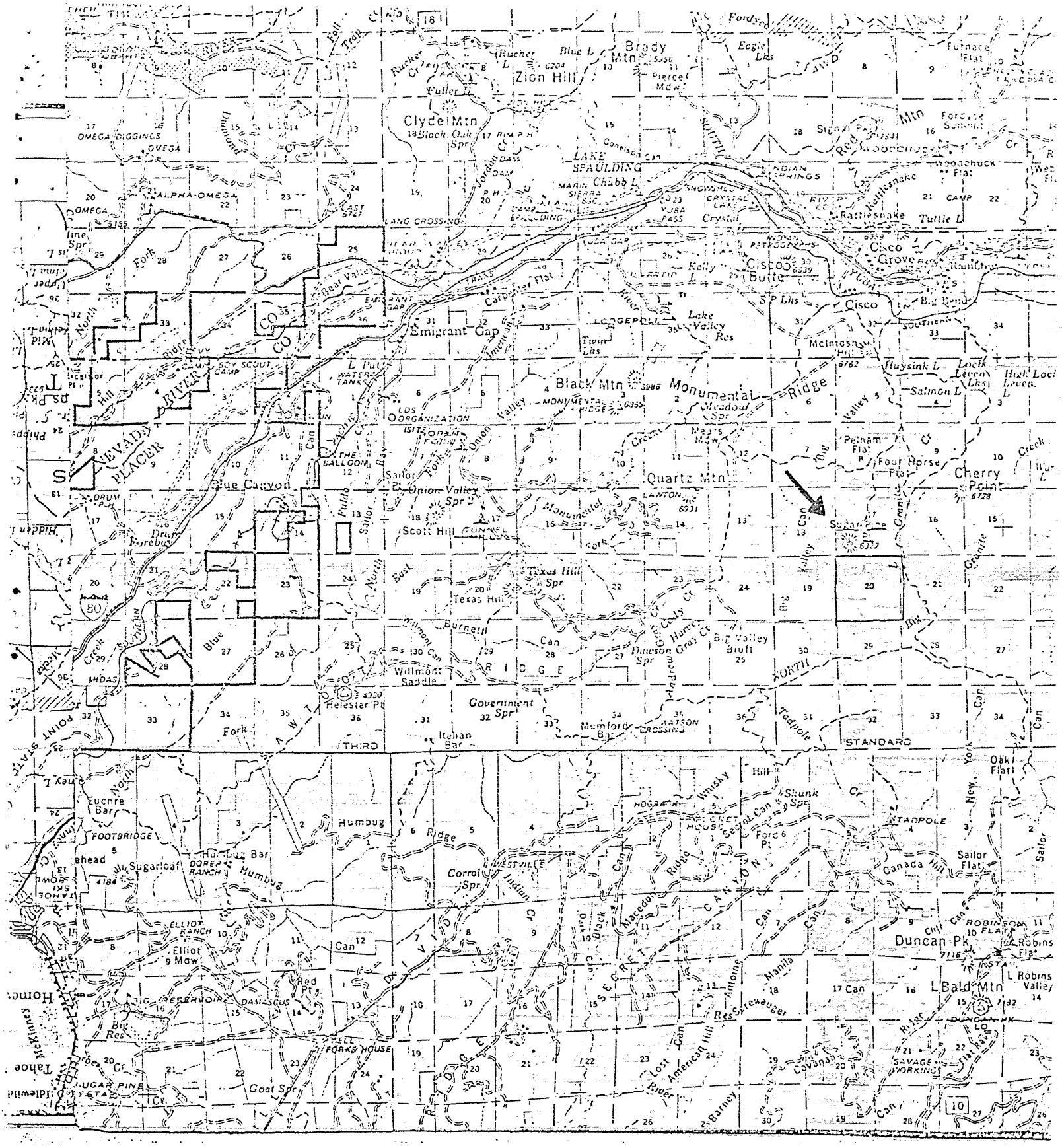
2430 SALIX LEMMONII

SAXIFRAGACEAE

2520 RIBES ROEZLII

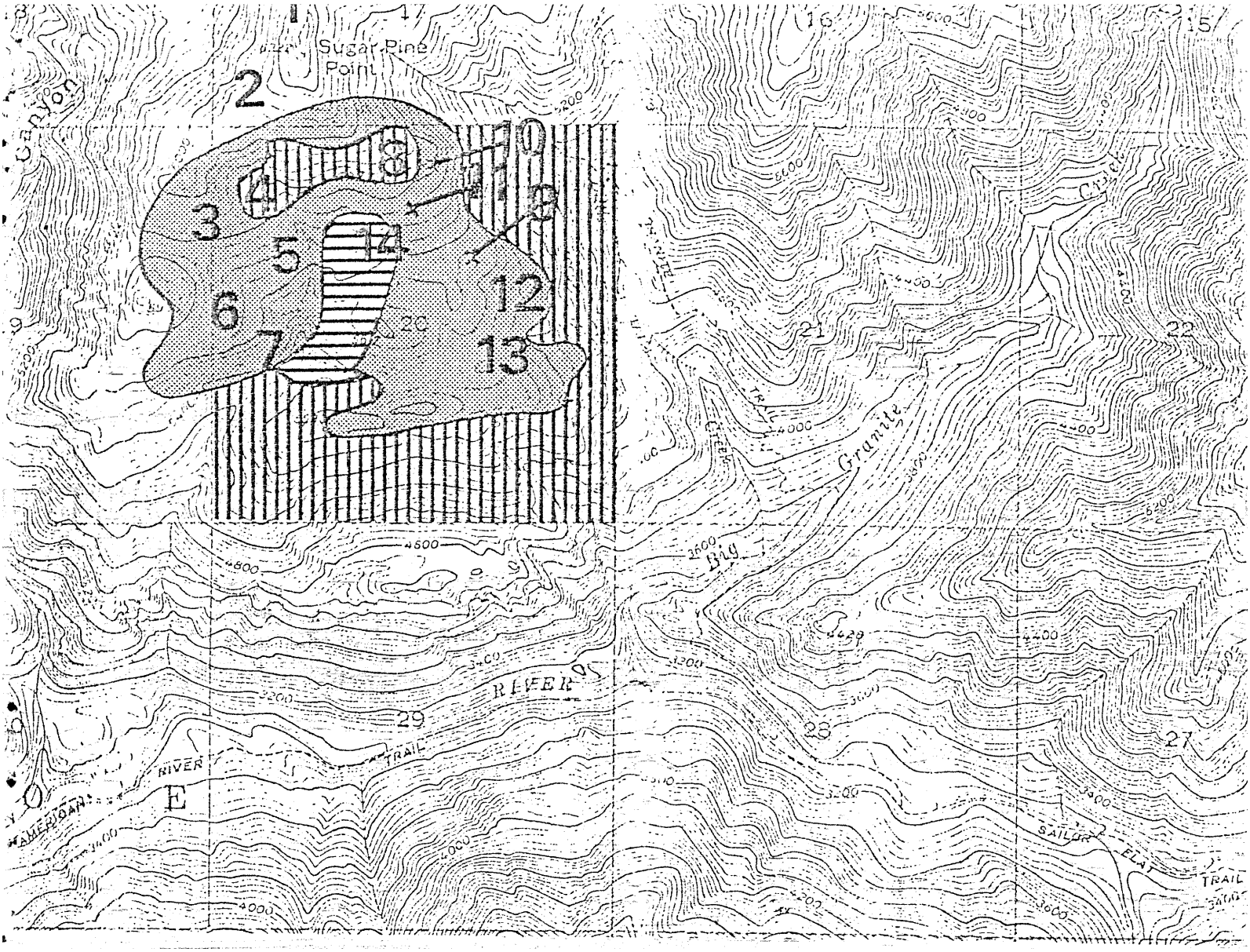
SCROPHULARIACEAE

2595 COLLINSIA PARVIFLORA
2600 COLLINSIA TORREYI
2610 CORDYLANTHUS BOLANDERI
2705 PEDICULARIS SEMIBARBATA
2710 PENSTEMON DEUSTUS
2715 PENSTEMON LAETUS VAR ROEZLII




MAP 1

Regional map. The Sugar Pine Point area is section 20.




MAP 2 Sugar Pine Point area. Location of sample plots indicated.

legend:

SAF 243 Ponderosa Pine-Sugar Pine-Fir

SAF 246 California Black Oak

Montane Chaparral & Rock communities